ATTACHMENT 3 – WORK PLAN

APPENDIX L

Oakes Basin Demonstration Project,
Technical Memorandum – Basis of Design,
Riparian Habitat Restoration Sections,
H.T. Harvey and Associates,
April 1999

OAKES BASIN DEMONSTRATION PROJECT
TECHNICAL MEMORANDUM – BASIS OF DESIGN
RIPARIAN HABITAT RESTORATION SECTIONS

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April 15, 1999

Project No. 1262-01

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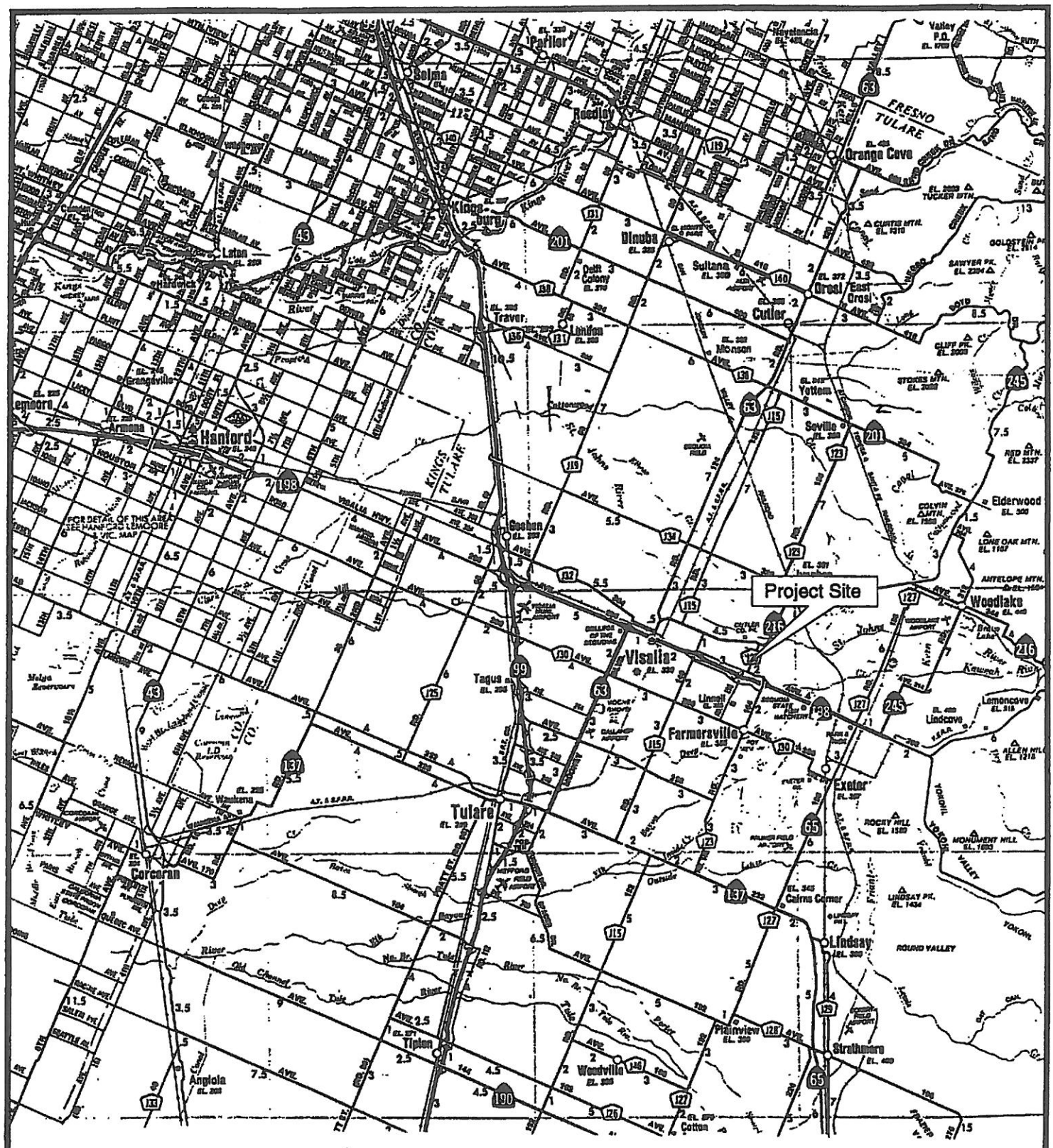
1.0 INTRODUCTION

This report provides a description of the design and rationale behind key habitat restoration elements for the Oakes Basin Demonstration Project. The approximately 42-acre Oakes Basin Demonstration Project Site (Figure 1) is located within the Kaweah River Delta, immediately west of the division of the Kaweah River into Packwood and Mill Creeks, in Visalia, California. In the mid 1800's the Kaweah River Delta supported the largest stand of valley oak (*Quercus lobata*) riparian forest in the world (McClaron 1983). The vast majority of this habitat type has since been eliminated as a result of conversion of forest to agriculture. A significant component of the Oakes Basin Restoration project includes the restoration of Valley Oak Riparian Forest. The project proponent, the Kaweah Water Conservation District, is planning to construct the Oakes Basis Project as a flood water retention/groundwater recharge basin with habitat restoration incorporated into the basin design.



H.T. HARVEY & ASSOCIATES
ECOLOGICAL CONSULTANTS

Oakes Basin Demonstration Project:
Vicinity Map

File No. 1262-01	Date 4/7/99	Figure 1

2.0 RIPARIAN HABITAT RESTORATION DESIGN CRITERIA

The overall objective of the riparian habitat restoration design is to provide for the establishment of self-sustaining riparian habitat similar in plant species composition and structure to existing, relatively undisturbed riparian habitat in the Kaweah River Delta. Valley oak is the dominant riparian species in these remaining remnants of riparian habitat. The following criteria were used to guide the riparian habitat restoration design:

1. Plant species composition in the restoration area will be similar to that in adjacent valley oak dominated areas.
2. Topsoil texture, organic matter content, and fertility in the restoration area will be similar to that in adjacent valley oak dominated areas.
3. Riparian habitat restoration areas will be immediately adjacent to Packwood and Mill Creeks, to the extent possible.
4. Flooding of portions of the riparian restoration area will mimic the natural hydrology of valley oak dominated riparian habitat, to the extent possible and feasible.

3.0 RIPARIAN HABITAT RESTORATION

3.1 Location and Conceptual Design of Restoration Areas

3.1.1 Perimeter Restoration Area

Valley oak dominated riparian habitat will be restored throughout an approximately 100-foot wide area around the perimeter of the two recharge basins. This restoration area is positioned between the outboard toe of the recharge basin levee and the top-of-bank along Packwood and Mill Creeks and along both sides of Oakes Ditch. A 12-foot wide earthen access road is also planned along Packwood and Mill Creeks and along both sides of Oakes Ditch. Wherever feasible, given maintenance access concerns, we recommend positioning the access road along the toe or top of the levee to allow the riparian habitat restoration area to extend to the edge of the creek banks. The productivity of riparian vegetation would likely be higher along the top-of-bank due to higher soil moisture levels in the root zone. Vegetation immediately adjacent to the creek enhances the aquatic habitat value significantly, providing shading and detritus for the aquatic food chain. This enhances value for many of the wildlife species associated with the riparian forest. Additional benefits of restoring riparian habitat along the top of the creek banks are presented below in Section 3.2.

Downstream users have expressed concern that riparian habitat establishment along Oakes Ditch might reduce the surface flows in this irrigation ditch (Tobia 1999 pers. comm.). Oakes Ditch is used to transport irrigation water intermittently from May through August during certain years. A buffer distance of 20 feet will be established between the riparian tree plantings and the centerline of Oakes Ditch to minimize the effect of the plantings on surface flows in the ditch. In addition, a 12-foot wide dirt

access road will be positioned between the plantings and the ditch. The 20-foot buffer should prevent tree roots from interacting with seepage water from Oakes Ditch in the short term (first 10-20 years after planting), when the trees are young and relatively small.

The roots of mature valley oak trees could eventually reach the ditch from a distance of 20 feet. Evaluation of the potential for mature valley oak plantings to significantly effect the surface flow rate in Oakes Ditch would require additional information. In particular, we would need a prediction of seepage rates from Oakes Ditch in the absence of trees and time for a literature review on transpiration rate measurements for mature trees in the white oak group (subgenus *Quercus*).

3.1.2 Riparian Habitat Restoration Terrace

Valley oak are adapted to flooding during the rainy season and historically valley oak riparian forest flourished in the flood prone Kaweah River Delta. In an effort to restore valley oak riparian habitat in a flood prone area, a riparian habitat restoration terrace (terrace) will be constructed along the inside of the northern recharge basin (basin number 2) levee. The terrace will be approximately 500 feet long and 20 feet wide (CDM to provide plan view figure). To minimize reductions in the water storage volume of the recharge basin, the surface area of the terrace was restricted to a small portion of the recharge basin. The terrace was positioned in the northeastern portion of basin number 2 to improve the habitat values associated with riparian habitat restoration along Mill Creek. Mill Creek was chosen over Packwood Creek because it generally has flow longer in the season.

The terrace will flood periodically between November and March 30, primarily during wet years when the recharge basin is utilized for flood detention and groundwater recharge. To ensure the survival of riparian vegetation, the terrace should generally not be inundated from approximately April 1 through October 1. For groundwater recharge events where the flooding duration will range from approximately 2 weeks to 2 months, inundation depth across the terrace should generally not exceed 2 feet, whenever possible. The flooding depth on the terrace can exceed 2 feet for stormwater detention events where the flooding duration will be considerably shorter (approximately 24 hours).

Restoration of riparian habitat on the terrace will have the following benefits:

1. Potential for development of highly productive riparian habitat due to greater water availability in soils.

2. Over time the canopy of trees planted on the inboard and outboard side of the levee should overlap to form a continuous tree canopy over the levee.

3. Periodic flooding will promote natural recruitment of native riparian species and consequently shorten the time for development of mature riparian habitat.

3.2 Functions and Benefits

1. Restore a small portion of the once large expanse of valley oak dominated riparian habitat within the Kaweah River Delta; a rare habitat type that is highly regarded for its ecological value.

2. Help to reduce the lateral migration of shallow subsurface water into adjacent walnut orchards and Packwood Creek via root uptake.

3. Provide habitat for plant and animal species typically associated with valley oak dominated riparian habitat in the Kaweah River Delta.

4. Where riparian habitat is restored along the top of creek banks; help improve creek water quality (e.g. lower water temperatures, lower turbidity, higher dissolved oxygen levels), increase the abundance and diversity of aquatic animal species and decrease erosion of creek banks.

3.3 Riparian Restoration Area Topsoil

Appropriate topsoil texture, organic matter content and nutrient levels are critical to the successful establishment of native riparian trees and shrubs at the site. Valley oak dominated riparian habitat typically occurs on relatively fertile, alluvial soils with a loam texture. Topsoil sampling and analysis was conducted to evaluate the suitability of existing topsoil within the restoration area. A minimum of five soil subsamples were collected from each of three different areas; mature valley oak riparian habitat reference area along Packwood Creek (oak tree sample), existing berms at the site (berm sample comprised of stockpiled topsoil), and portions of the proposed restoration area where topsoil was removed (field soil sample). Soil samples were collected on May 1, 1998 and were analyzed at Fruit Growers Laboratory, Inc. Three composite samples, made up of five subsamples from each area, were analyzed for texture, organic matter percentage, pH, electrical conductivity (ECe), sodium adsorption ratio (SAR), macronutrient and micronutrient concentrations (Appendix 1).

Texture, organic matter content, and nutrient levels were comparable between the oak tree reference and the stockpiled topsoil in the berm samples (Appendix 1). Both samples exhibited a sandy loam texture and moderate organic matter content (2.3 – 2.8 %). The organic matter content (1.2 %) and levels of N, P, K, Ca, Mg, and Zn were considerably lower in the field soils compared to the oak tree and berm soils. In summary, the portions of the existing berm where topsoil was stockpiled appear suitable for riparian habitat establishment and growth, whereas fertility is marginal for riparian habitat establishment in the field soils where topsoils were stripped.

We assume that the topsoil has been removed from the majority of the restoration area south of Oakes Ditch during the construction of the pilot berms and basins. Based on this assumption and the above soil analysis, topsoil stockpiled in the existing pilot berms should be respread to a minimum depth of 12 inches throughout the entire riparian

restoration area south of the existing Oakes Ditch flowline. The backfilled soil surface should be contour graded using tracked equipment to yield a smooth relatively flat surface. Care should be taken during grading of the backfilled topsoils to minimize compaction. Low compaction grading methods should be utilized to ensure that post-grading compaction is 85% - or less.

No amendments or topsoil addition should be required north of the Oakes Ditch flowline where existing topsoils have not been stripped.

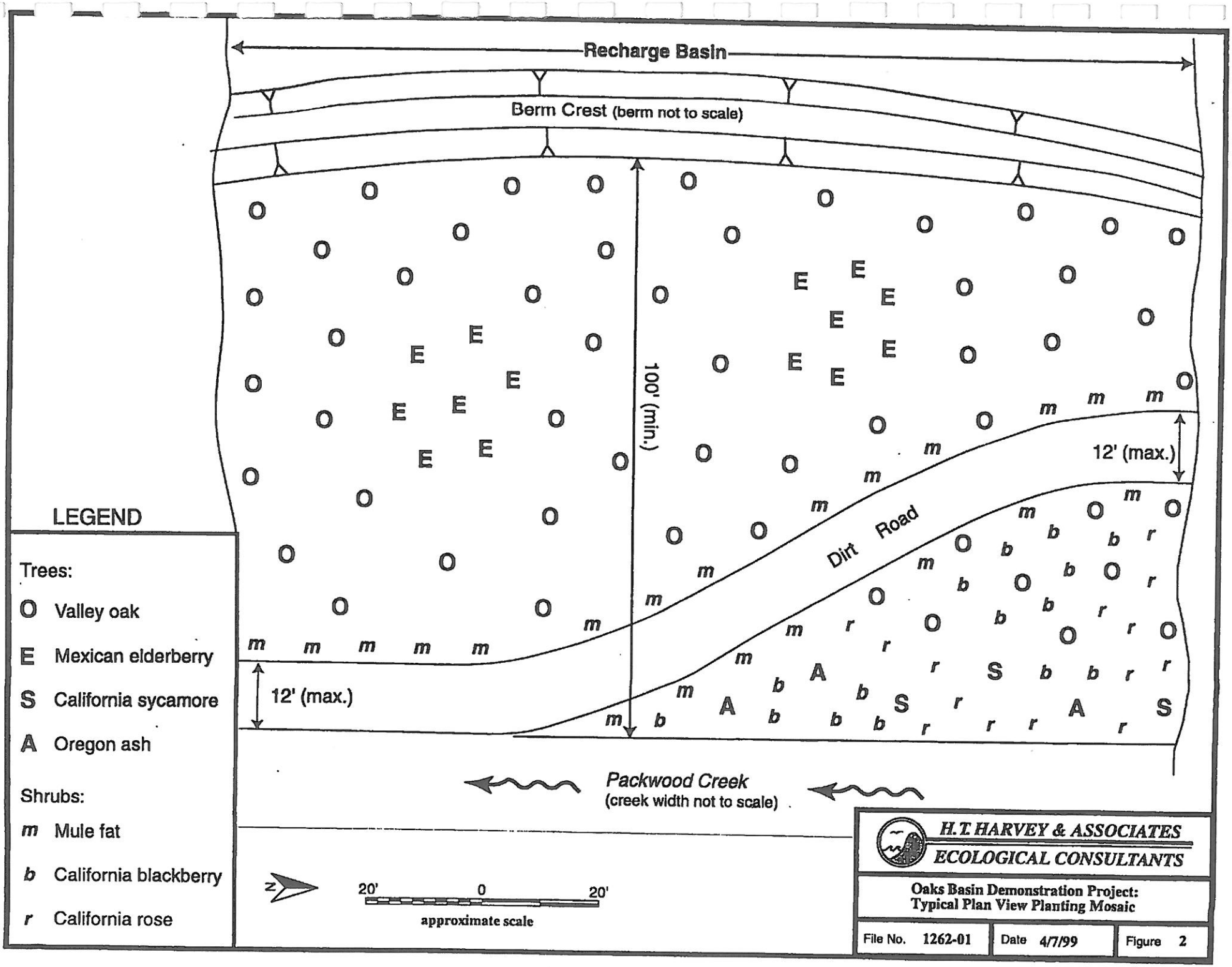
3.4 Planting Plan

3.4.1 Planting Palette and Layout

Native trees and shrubs will be planted and maintained for a three year period to help ensure the rapid establishment of valley oak dominated riparian habitat in the restoration areas. Plant species selection was based on the woody species composition along Packwood and Mill Creeks, the woody species composition in existing remnant stands of riparian habitat within the Kaweah River Preserve (Griggs 1983) and on the restoration area hydrology. Trees will be planted on an average of 15-foot centers throughout the restoration area. In an effort to lower habitat restoration costs, the shrub plantings will be limited to approximately 20 % of the restoration area, primarily near the top-of-bank along Packwood and Mill Creeks. Table 1 presents the plant installation specifications and Figure 2 provides a typical plan view of the planting mosaic.

The tree layer will be dominated by valley oak with occasional clumps of Mexican elderberry (*Sambucus mexicana*) (4-8 elderberries per clump) and a low abundance of California sycamore (*Platanus racemosa*) and Oregon ash (*Fraxinus latifolia*). Valley oak will be planted throughout the restoration area, whereas California sycamore and Oregon ash plantings will be located at the top-of-bank along Packwood and Mill Creeks (Figure 2) and at the lower end of the riparian terrace. Mexican elderberry will be installed in the drier locations, of the site, near the toe of the basin berm.

The shrub layer will be dominated by mulefat (*Baccharis salicifolia*) with a slightly lower abundance of California blackberry (*Rubus ursinus*) and California wild rose (*Rosa californica*) (Table 1). In general, shrub planting areas will occupy approximately 20% of the perimeter restoration area. Shrub plantings will be located within 50 feet of the top-of-bank along portions of Packwood and Mill Creeks (Figure 2). Mulefat could be planted along portions of the dirt access roads as a visual and noise screen to help minimize the indirect effects of vehicle traffic on wildlife.


Recharge Basin
Berm Crest (berm not to scale)
100' (min.)
12' (max.)
12' (max.)
Dirt Road
Packwood Creek
(creek width not to scale)
LEGEND
Trees:
O Valley oak
E Mexican elderberry
S California sycamore
A Oregon ash
Shrubs:
m Mule fat
b California blackberry
r California rose
N
20' 0 20'
approximate scale
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Oaks Basin Demonstration Project:
Typical Plan View Planting Mosaic
File No. 1262-01
Date 4/7/99
Figure 2

3.4.2 Container Sizes

The container types and sizes specified in Table 1 were selected to maximize the long-term survival and growth of the respective species. Treepots and deepots are relatively small containers especially designed for habitat restoration. If desired, a maximum of 5% of the valley oak plantings could be installed from larger container stock (5 gallon – 24 inch square box containers) to provide a few larger trees for visual appeal. The percentage of oaks transplanted from large containers will not exceed 5% because of the lower long-term growth rates and substantially higher cost of large container stock compared to treepots.

3.4.3 Source of Plants

The container plants to be installed within the mitigation site (Table 1) will be contract grown at a nursery with experience in the propagation of California native riparian species. Propagules (seeds and cuttings) will be collected from native plant populations within the Kaweah River Delta, in Tulare County as close to the project site as possible. The plant collection zone will be expanded to areas within Kings County if all of the propagules required cannot be collected from within Tulare County.

3.4.4 Timing of Propagation

After plant propagules are collected, 8-12 months of growing time is generally required before the plants are ready for installation. Seed for valley oak, Mexican elderberry, California sycamore, and Oregon ash are ripe and should be collected during the fall, 12 months prior to plant installation. California blackberry, California wild rose, and mule fat can be propagated from cuttings collected in the fall and/or spring 6-12 months prior to plant installation.

3.4.5 Soil Amendments

Soil amendments are not required since the topsoils in the existing berms will be spread to a depth of 18 inches throughout portions of the restoration area where topsoil was removed

Table 1. Plant Installation Specifications for the Oakes Basin Riparian Restoration Site.

Common Name	Scientific Name	On-Center Spacing (feet)	Percent of Total Number of Trees Installed	Approx. Number to be Installed/ Acre	Container Size[1]
Trees:					
valley oak	*Quercus lobata*	16	70 %	153	treepot-4 *
Mexican elderberry	*Sambucus mexicana*	12	20 %	43	deepot *
California sycamore	*Platanus racemosa*	16	5 %	11	treepot-4 *
Oregon Ash	*Fraxinus latifolia*	16	5 %	11	treepot-4 *
Shrubs:			**Percent of Total Number of Shrubs Installed**		
mule fat	*Baccharis salicifolia*	10	40 %	52	deepot *
California blackberry	*Rubus ursinus*	8	30 %	39	deepot *
California wild rose	*Rosa californica*	8	30 %	39	deepot *

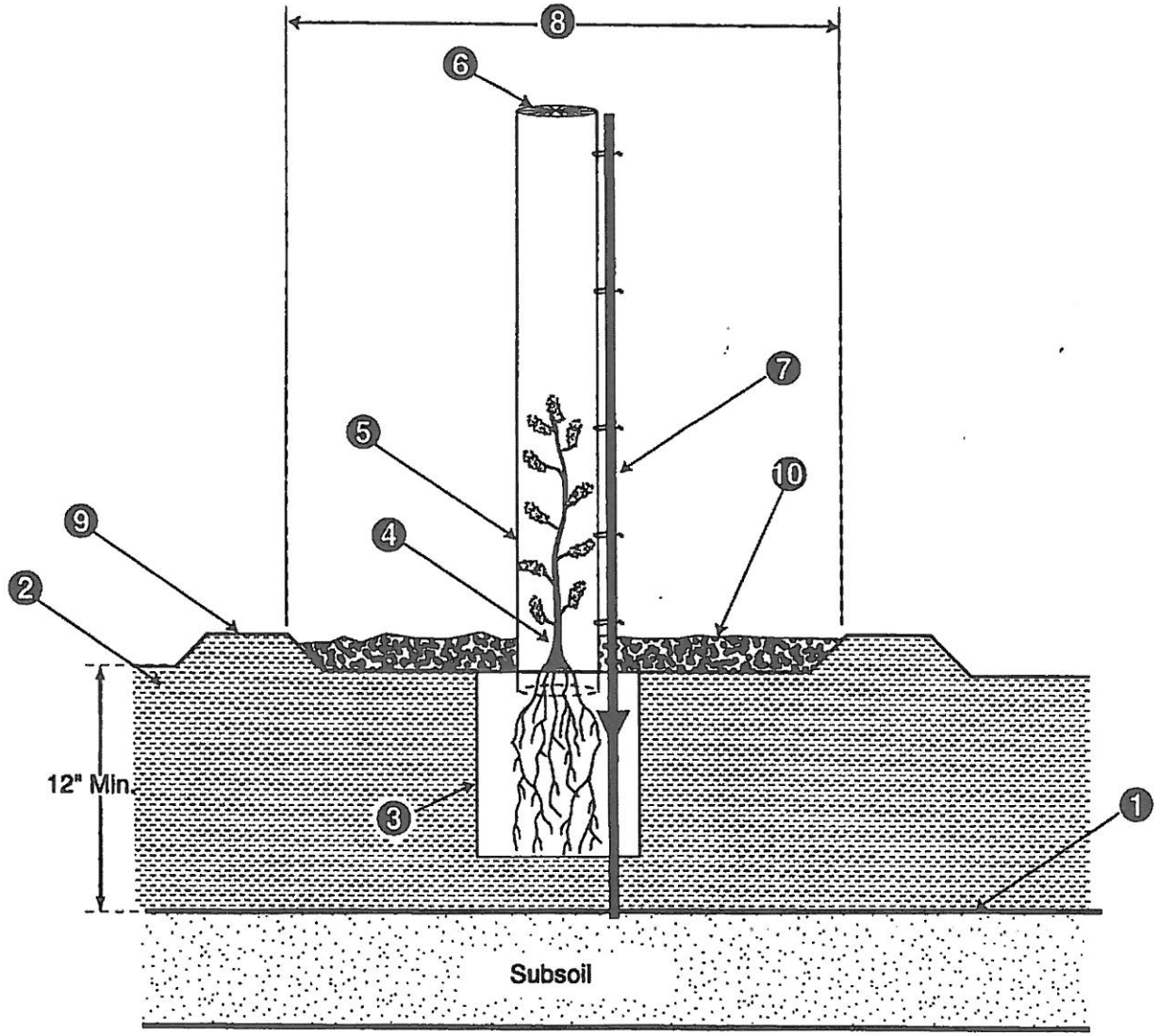
[1] A relatively small proportion of valley oak (5 % maximum) can be transplanted from larger container stock for aesthetic purposes.

* treepot-4 = 4" square x 14" long. deepot = 2 ½" diameter X 10" long

3.4.6 Plant Installation

Trees and shrubs should be planted between October 15 and February 15 when the plant material is relatively dormant and the soil moisture is relatively high. Plant installation outside of this window would require increased irrigation and would likely incur higher rates of mortality.

Figure 3 provides a typical plant installation detail. The planting holes will be 2-feet in diameter and equal in depth to that of the containers. The sides and bottom of each hole will be scarified and each planting hole will be irrigated before planting and irrigated again immediately following planting. The plants will be installed so that their root crowns are at or slightly above (up to 0.5 inches) the soil surface following soil settlement after irrigation.



LEGEND

1. Original grade in areas stripped of topsoil
2. Minimum 18" deep layer of respread native topsoil harvested from existing berms
3. Auger planting hole
   - hole diameter = 2 feet
   - hole depth = 1X container depth
   - scarify sides and bottom of hole
4. Installed seedling tree or shrub
5. Tree shelter (3-1/4" to 4-1/4" diameter by 4' height) Bury base 2" into topsoil
6. Protective wire cover
7. Metal t-post (5.5' long), drive t-post approximately 1.5' into ground and fasten tree shelter to post with ratchet-lock ties
8. Irrigation basin (min 3' dia.)
9. Basin berm min 4" wide at top and 4" above basin grade
10. Wood chip layer (min 3" depth)

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Oakes Basin Demonstration Project:
Container Stock Installation

File No. 1262-01	Date 4/7/99	Figure 3

3.4.7 Plant Protection

Photodegradable tree shelters (shelter height = 4 feet) will be installed for the valley oak plantings. The tree shelters will both increase soil moisture in the vicinity of the oak plantings and reduce potential animal damage. Tree shelters have been shown to increase the percent survival and height increment for oak plantings when implemented in concert with weed control (McCreary and Tecklin 1992). No plant protection is proposed for the other species to be planted. The other species planted will be observed during the first few years following plant installation to determine if animal damage is significantly affecting plant establishment. If observations reveal that animal damage is a significant problem for trees and shrubs planted without protection, measures will be taken to alleviate the problem.

3.4.8 Irrigation Plan

The riparian plantings will be irrigated with a bubbler irrigation system or a water truck. A bubbler irrigation system is recommended and is superior to truck watering for the following reasons:

1. Lower cost compared to truck watering over 3 year period (see Section 4.0).

2. Higher plant survival.

Irrigation water will be retained adjacent to the plants with the construction of a 3-foot diameter irrigation basin surrounded by a, 4-inch high, 4-inch wide earthen berm (Figure 3). The tree and shrub plantings will be irrigated for 3 years after plant installation. Generally, irrigation is not be required after the third year. In Year 1, the plantings will be irrigated with enough regularity (approximately 3-5 times per month), from March through October, to keep the soils moist within the root zone. The irrigation schedule in Year 2 will be based on the water requirements of the plants and is anticipated to be substantially less (approximately 2-3 times per month). In Year 3, little irrigation (0-2 times per month) will be required. Each tree and shrub should be irrigated with 10 or more gallons during each irrigation event.

3.4.9 Natural Recruitment of Native Plants

Natural recruitment (colonization) of the restoration area by native woody species would increase the rate of establishment of high quality riparian habitat. Therefore, native plant species that naturally colonize within the restoration area will be encouraged. Landscape personnel responsible for maintenance of the site will be trained to recognize native plant species so they are not inadvertently removed during weed control operations.

3.5 Hydroseed Plan

All slopes constructed via cut or fill (e.g. levee side slopes surrounding the recharge basins) should be hydroseeded to provide herbaceous cover for improved erosion control and visual aesthetics. In addition, the rapid establishment of herbaceous cover through hydroseeding will enhance wildlife habitat by providing cover and forage. Table 2 provides the species mix and seed application rates for hydroseeding. The species to be hydroseeded were selected to both help provide effective erosion control and to enhance the diversity of native species that compose the herbaceous cover at the project site.

Fertilizer, wood fiber, tackifier, and straw (if required for erosion control) application rates will be developed during the preparation of the plans and specifications.

Table 2. Hydroseed Species Mix and Seed Application Rates.

Common Name	Scientific Name	Type	Minimum Percent Germination	Application Rate Pure Live Seed (lbs/acre)
blue wildrye	*Elymus glaucus*	perennial grass	80	25
meadow barley	*Hordeum brachyantherum*	biennial grass	80	30
Zorro fescue	*Vulpia myorus*	annual grass	80	10
arroyo lupine	*Lupinus succulentus*	annual leguminous forb	75	10
California poppy	*Eschscholzia californica*	annual forb	75	2.0

3.6 Maintenance Plan

3.6.1 Objective

The objective of the site's maintenance program will be to foster the establishment of native riparian vegetation (trees and shrubs) in the restoration area. The maintenance program will be designed to quickly establish native riparian vegetation that will eventually survive and thrive without the need for irrigation, weed control, or plant protection.

3.6.2 Maintenance Period/Schedule

The maintenance period is defined as the 3-year period that follows plant installation. During this period, the riparian plantings will be regularly maintained. Maintenance activities will occur 3-5 times per month (depending on irrigation requirements) during the growing season (March-October) and approximately once per month from November-

February. The plant establishment period and associated site maintenance will be extended if significant plant replacement is required due to low plant survivorship.

3.6.3 Irrigation

The riparian tree and shrub plantings will be watered with a bubbler irrigation system or by truck during the 3-year maintenance period as described in section 3.4.8 above. The irrigation basin berms around each planting will be kept in good working order, to ensure the retention of irrigation water.

3.6.4 Weed Control

Weeds will be controlled within the riparian restoration area. The irrigation basins will be kept weed free by maintaining the thickness of the wood chip mulch layer and by manual removal or careful application of herbicides to the weeds that establish in the mulch. Weeds throughout the riparian mitigation site will be kept to a maximum height of 1 foot year round. Weed control throughout the site will primarily occur with the use of "weed whackers". Weeds will be controlled with weed whackers a minimum of two times per year in mid-late spring and again in early summer. In addition, selective use of herbicides may be required to control highly invasive weeds that become established. The location of tree and shrub plantings and any naturally recruited native woody species should be flagged to avoid damaging them with "weed whackers" or mowers.

3.6.5 Plant Protection

The tree-shelter T-posts will be adjusted as needed to ensure that the tree-shelters remain vertical. The protective wire cover across the top of the tree-shelters will be removed when the trees reach 4 feet in height. The tree-shelters will be removed and discarded off site when the tree shelters begin to decay approximately five-years after installation.

3.6.6 Supplemental Planting

The site will be planted at a sufficient density such that the site's habitat restoration objectives will be met. Plant replacement will not be required with a modest level of plant mortality. However, dead plants should be replaced if plant survival falls below 70% during the 3-year maintenance period.

3.6.7 Long-term Monitoring

A brief long-term monitoring plan for the site will be prepared with the project's operation and maintenance manual. The long-term monitoring plans will include habitat restoration success criteria and the methods used to assess habitat development. At a minimum, the long-term monitoring for the site will include plant survival and site maintenance monitoring.

4.0 COST ESTIMATE

Table 3 provides a cost estimate/acre for plant installation and weed control for 3 years of maintenance at the riparian restoration area. Tables 4 and 5 provide a cost estimate/acre for habitat restoration employing irrigation via truck watering versus a bubbler irrigation system, respectively. These cost estimates were based on the following assumptions:

1. The planting mosaic and on-center spacing conforms to that specified in the above planting plan (Section 3.4).
2. Plants are planted in a triangular grid.
3. Labor rate is $15.00/hour.
4. Water costs for irrigation are not included.
5. The cost estimate for irrigation with a water truck assumes a rate of $50/hour (water truck + labor), use of a relatively large water truck (2,500-3,000 gallons) and source of water is within approximately 3 miles of the site.

Table 3. Estimated Cost for Oakes Basin Riparian Plant Installation and 3 Years of Maintenance (Irrigation System or Truck Watering Not Included).

Description	Materials Cost/Acre	Labor Cost/Acre	Total Cost/Acre
257 custom collected plants delivered to site	$5/plant = $1285		$1285
Planting 257 plants		$2.5/plant = $643	$643
Build 257 irrigation basins		$2.5/plant = $643	$643
152 tree shelters and T-posts	$5/shelter and t-post = $760	$2.5/shelter = $380	$ 1140
Place wood chip mulch in 257 irrigation basins	$15/cubic yard x 17 cubic yards = $255	$1/plant = $257	$ 512
3 years of weed control within irrigation basins = 6 sessions	$0.1/plant for herbicide X 257 plants X 6 sessions = $154	$0.5/plant herbicide x 257 plants x 6 sessions= $ 771	$925
3 years of weed control over entire planting area using weed wackers = 6 sessions	$ 261/session x 6 sessions = $ 1566 (includes labor and materials		$1566
Plant replacement (15% of the plants)	$ 5/plant x 39 plants = $195	$ 3.75/plant x 39 plants = $146	$341
Subtotal	**$4215**	**$2840**	**$7055**
Contingencies (10%)	$422	$284	$706
TOTAL (irrigation not included)	**$4637**	**$3124**	**$7761**

Table 4. Estimated Cost for Oakes Basin Riparian Plant Installation and 3 Years of Maintenance Assuming Irrigation With a Water Truck.

Description	Materials Cost/Acre	Labor Cost/Acre	Total Cost/Acre
3 years of irrigation by truck watering = 48 irrigations		12hrs labor x $50/hr X 48 irrigations = $28,800	$28,800
Repair irrigation basins as needed over 3 year period		$2/plant x 257 plants= $514	$514
Subtotal (truck watering)			**$29,314**
Contingencies (20%)			$5,863
Cost of plant installation/weeding (from Table 3)			$7,761
TOTAL			**$42,938**

Table 5. Estimated Cost for Oakes Basin Riparian Plant Installation and 3 Years of Maintenance Assuming Irrigation With a Bubbler Irrigation System.

Description	Materials Cost/Acre	Labor Cost/Acre	Total Cost/Acre
Bubbler irrigation system design		$400	$400
Bubbler system installation		$25/plant x 257 plants = $6425 (labor and materials included)	$6,425
Maintenance of bubbler system to ensure proper irrigation	$1/plant x 257 plants = $ 257	3 hrs/irrigation x $15/hr x 48 irrigations = $2,160	$2,417
Repair irrigation basins as needed over 3 year period		$1.25/plant x 257 plants= $321	$321
Subtotal (bubbler irrigation system)	$257	$9,306	**$9,563**
Contingencies (10%)	$26	$931	$956
Cost of plant installation/weeding (from Table 3)			$7,761
TOTAL			**$18,280**

5.0 LITERATURE CITED

Griggs, T. 1983. Kaweah Oaks Preserve. *Fremontia.* 11(3):25.

McClaran, M. 1983. Visalia and the valley oak. *Fremontia.* 11(3):23-25.

McCreary, D. and J. Tecklin. 1992. Effects of Tree Shelters and Weed Control on Blue Oak Growth and Survival. Oak's and Folks: The Newsletter of the Integrated Hardwood Range Management Program.

Tobia, P. 1999. Personal communication between Pete Tobia (CDM) and Max Busnardo (H.T. Harvey & Associates) concerning effect of riparian restoration on Oakes Ditch surface flows (April 5, 1999).

APPENDIX 1: Soil Analysis

FRUIT GROWERS LABORATORY, INC.

Analytical Chemists

May 27, 1998

LAB No: SP 803287-01

Fugro West
5855 Olivas Park Drive
Ventura, CA 93003-7672

Property: Oakes Basin- 96710805

Date Sampled : May 1, 1998
Date Received : May 6, 1998
Sampled By : Lori Prentice
Depth : 12 - 24"

SOIL ANALYSIS DATA: Primary and Secondary Nutrients

Table 1 of 3

Sample Area	Crop Variety	PPM Nitrate-N	PPM Phosphorus	PPM Exch. K	meq/L Sol. K	PPM Exch. Ca	meq/L Sol. Ca	PPM Exch. Mg	meq/L Sol. Mg	PPM Exch. Na	meq/L Sol. Na	meq/L Sulfate
Oak Trees	Oak Trees	12	34	310	1.8	1800	12	150	2.9	50	3.1	11
Dike	Oak Trees	22	33	230	1.2	1400	4.7	110	1.3	0	0.8	0.8
Field Samples	Oak Trees	5.3	12	80	0.0	1400	0.9	150	0.2	0	0.5	0.5
Optimum Range		10 - 70	12 - 80	81 - 500	0.25 - 1.0	---	2.0 - 20	---	1.5 - 4.5	---	Soa SAR	0.6 - 20

SOIL ANALYSIS DATA: Micro Nutrients and Base Saturation

Table 2 of 3

Sample Area	PPM Zinc	PPM Manganese	PPM Iron	PPM Copper	PPM Boron	meq/L Chloride	meq/100g CEC	% CEC - Ca	% CEC - Mg	% CEC - K	% CEC - Na	% CEC - H
Oak Trees	3.2	4.5	25	1.0	0.35	1.5	11	82	11	7.3	1.8	0.0
Dike	5.3	32	110	5.7	0.15	0.8	8.8	83	10	7.0	0.0	0.0
Field Samples	0.6	2.9	50	1.4	0.10	0.3	8.6	84	14	2.3	0.0	0.0
Optimum Range	0.7 - 20	1.4 - 30	8.0 - 60	0.2 - 5.0	0.02 - 1.5	0.1 - 4.0	Variable	60 - 80	10 - 20	2 - 5	0 - 5	0 - 3

SOIL ANALYSIS DATA: Additional Elements

Table 3 of 3

Sample Area	--- pH	mmhos/cm ECe	SAR	% Limestone	Tons/AF Lime Req	% Saturation	% Moisture	Low	Opt	High	% Org. Matter	% Sand	% Silt	% Clay
Oak Trees	7.3	1.6	1.1	0.0	0.0	38	13				2.3	62	27	11
Dike	7.4	0.58	0.4	0.0	0.0	39	16				2.8	70	21	9.2
Field Samples	8.5	0.16	0.7	0.0	0.0	37	14				1.2	50	39	11
Optimum Range	5.8 - 8.2	0.5 - 4.0	0.1 - 8	0 - 0.1	---	20 - 60	1/2 Satn. %				---	---	---	---

Good: :Problem

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

Corporate Offices & Laboratory
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ATTACHMENT 3 – WORK PLAN

APPENDIX M

Oakes Basin Demonstration Project, Riparian Habitat Restoration Draft – Plans and Technical Specifications, H.T. Harvey and Associates, August 1999

H.T. HARVEY & ASSOCIATES
ECOLOGICAL CONSULTANTS

DRAFT

OAKES BASIN DEMONSTRATION PROJECT RIPARIAN HABITAT RESTORATION DRAFT - PLANS AND TECHNICAL SPECIFICATIONS

Prepared by:

H.T. Harvey & Associates

Ronald Duke, M.A., Principal
Daniel Stephens, B.S., Senior Restoration Ecologist
Patrick Reynolds, M.S., Restoration Ecologist, Project Manager
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Prepared for:

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August 6, 1999

Project No. 1262-01

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DRAFT

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DRAFT

1.0 GENERAL

1.1 BACKGROUND AND DEFINITIONS

The Oakes Basin Demonstration Project Site is located within the Kaweah River Delta, immediately west of the division of the Kaweah River into Packwood and Mill Creeks, in Visalia, California (Figure 1). The project objective is to construct two groundwater recharge/stormwater detention basins and restore valley oak dominated riparian habitat around the perimeter of the recharge basins. In the mid 1800's, the Kaweah River Delta supported the largest stand of valley oak (*Quercus lobata*) riparian forest in the world, however, the majority of this habitat type has been converted to agricultural lands. The plans and specifications presented below describe the work required to accomplish the valley oak riparian habitat restoration component of the project. The term "owner's representative" refers to the Kaweah Delta Water Conservation District's assigned site inspector/monitor for the habitat restoration work described below.

1.2 SCOPE OF WORK

1.2.1 Planting Area Preparation and Plant Installation. Conduct site preparation, container plant procurement, and container plant installation within the Perimeter (9.3 acres), Berm (1.5 acres), and Terrace (1.1 acres) Planting Areas as described in the drawings and specifications presented herein. Figures 2 and 3 show the locations of these planting areas. Assure that the container plants purchased are in accordance with the specifications (Section 2.2).

All non-landscaping work such as grading required to construct the planting areas will be done by others.

1.2.2 Maintenance. Maintain the Perimeter, Berm, and Terrace Planting Areas for a three-year period. The three-year maintenance period shall begin immediately after revegetation installation (Section 3.3) is complete as determined by the owner's representative. If portions of the planting areas are installed in a phased sequence, maintain each portion completed for a period of three years following the revegetation installation (Section 3.3) in that portion.

If replanting is required, the replanted trees and shrubs will be maintained for 2 years from the time of installation (Section 4.5).

1.3 SUBMITTALS AND REVIEWS

1.3.1 Schedule. Submit the proposed schedule for plant procurement, planting area preparation, plant installation and maintenance including equipment, materials, and herbicides (if necessary) proposed for use.

1.3.2 Container Plants. Supply written documentation of the source and quantities by species of all containerized plant materials to be installed. Documentation shall include nursery documentation of the collection location(s) of plant propagules (seeds and/or cuttings).

1.3.3 Maintenance Log. The maintenance crew supervisor will keep a maintenance log of activities performed at each planting area throughout the entire three-year maintenance period. The maintenance log will provide the date and a brief summary of all work conducted including watering, weeding, tree shelter repair, wood chip mulch addition, irrigation basin repair and replanting. This log will be provided to the owner's representative within 48 hours of his/her request.

1.3.4 Reviews. The owner's representative will be responsible for conducting site reviews to evaluate the extent to which revegetation and site maintenance work meet the specifications presented herein.

2.0 MATERIALS

2.1 WATER

The Kaweah Delta Water Conservation District will provide a water truck, water truck operator, and water to meet all irrigation requirements during plant installation and the three-year maintenance period.

2.2 PLANT MATERIAL

2.2.1 Plant Procurement and Schedule. Procure the tree and shrub species and container types specified in Tables 1, 2, and 3 for each respective planting area. Assure that propagules (seeds and cuttings) for the container plants are collected from native plant populations within the Kaweah River Delta, in Tulare County. Order container plants by September 15 of the year prior to the year when planting will occur to allow the nursery sufficient time to collect and grow the plants. For example, plants should be ordered by September 15, 1999 if planting is scheduled for Fall 2000. Order the plants from a nursery(ies) with experience in the propagation of California native species. Submit the order information, including name and address of nursery and location of propagule source (s) to the owner's representative for approval. If all of the propagules required cannot be collected from source populations within Tulare County, the propagule collection zone can be expanded to locations within Kings County per the authorization of the owner's representative. Any changes to the plant species or numbers must be authorized by the owner's representative.

2.2.2 Quality Control of Plant Material. All necessary precautions shall be taken to ensure that the plants arrive at the site in proper condition for successful growth. Trucks used for transporting plants shall be equipped with covers to protect plants from windburn. The Contractor shall notify the owner's representative not less than 10 days prior to the plant delivery date. The owner's representative shall inspect the container plants prior to planting to determine if they are suitable for planting.

Upon delivery to the site, all container plants shall be vigorous and healthy in appearance, with a moist root ball, and with no evidence of root binding, pests, disease, or other forms of damage or ill health. Plants shall be the species shown on the plans and in Tables 1, 2 and 3 and shall be tagged with the scientific name identifying the plants by species. However, the owner's representative will make the determination of plant species and his/her decision shall be final. Any plant that, in the opinion of the owner's representative, is unacceptable based on the above specifications will be rejected and shall be replaced by the Contractor at his/her expense. The owner's representative may reject the entire lot of plants represented by the samples inspected.

Table 1. Plant Installation Specifications for Perimeter Planting Area (9.3 acres).

Common Name	Scientific Name	On-Center Spacing (ft)	% of Total Number of Trees Installed	Approx. Number/ Acre[1]	Container Size
TREES					
valley oak	*Quercus lobata*	16	70 %	156	treepot-4 [2]
Mexican elderberry	*Sambucus mexicana*	12	20 %	45	deepot [2]
California sycamore	*Platanus racemosa*	16	5 %	11	treepot-4 [2]
Oregon ash	*Fraxinus latifolia*	16	5 %	11	treepot-4 [2]
Total Number of Trees/Acre				**223**	
SHRUBS:			**% of Total Number Shrubs Installed**		
mule fat	*Baccharis salicifolia*	10	40 %	65	deepot [2]
California blackberry	*Rubus ursinus*	8	30 %	49	deepot [2]
California wild rose	*Rosa californica*	8	30 %	49	deepot [2]
Total Number of Shrubs/Acre				**163**	

[1] Tree numbers calculated to occupy 100% of the surface area. Shrub numbers calculated to occupy 25% of the surface area.

[2] treepot-4 = 4" square x 14" long. deepot = 2 ½" diameter x 10" long

Table 2. Plant Installation Specifications for Berm Planting Area (1.5 acres).

Common Name	Scientific Name	On-Center Spacing (ft)	% of Total Number of Trees Installed	Approx. Number/ Acre[1]	Container Size
TREES :					
Mexican elderberry	*Sambucus mexicana*	12	100 %	87	deepot [2]
Total Number of Trees/Acre				**87**	
SHRUBS :			**% of Total Number Shrubs Installed**		
mule fat	*Baccharis salicifolia*	10	50 %	190	deepot [2]
coyote brush	*Baccharis pilularis*	10	50%	190	deepot [2]
Total Number of Shrubs/Acre				**380**	

[1] Tree numbers calculated to occupy 25% of the surface area, Shrub numbers calculated to occupy 75% of the surface area.

[2] deepot = 2 ½" diameter x 10" long

Table 3. Plant Installation Specifications for Terrace Planting Area (1.1 acres).

Common Name	Scientific Name	On-Center Spacing (ft)	% of Total Number of Trees Installed	Approx. Number /Acre[1]	Container Size
Trees:					
valley oak	*Quercus lobata*	16	70 %	156	treepot-4 [2]
California sycamore	*Platanus racemosa*	16	15 %	33	treepot-4 [2]
Oregon Ash	*Fraxinus latifolia*	16	15 %	33	treepot-4 [2]
Total Number of Trees/Acre				**222**	
Shrubs:			**% of Total Number Shrubs Installed**		
mule fat	*Baccharis salicifolia*	10	40 %	65	deepot [2]
California blackberry	*Rubus ursinus*	8	30 %	49	deepot [2]
California wild rose	*Rosa californica*	8	30 %	49	deepot [2]
Total Number of Shrubs/Acre				**163**	

[1] Tree numbers calculated to occupy 100% of the surface area, Shrub numbers calculated to occupy approximately 25 % of the surface area.
[2] treepot-4 = 4" square x 14" long. deepot = 2 ½" diameter X 10" long

2.2.3 Storage of Plant Material. Begin installation of plant material immediately after delivery to the site and acceptance by the owner's representative. Ensure that container plants are stored in a shaded environment, safe from vandals, animals, or other sources of damage or loss until the plants are installed in the soil. Water plants in storage to keep the soils in the containers moist throughout the storage period.

2.3 HERBICIDES

Use herbicides approved by the EPA for use near or in aquatic environments (e.g. Rodeo). Provide herbicides in unopened containers with the original manufacturers' label.

2.4 TREE SHELTERS

Provide one photodegradable tree shelter for each valley oak to be planted. Tree shelters shall have the following dimensions: 3-1/4-inch to 4 ¼-inch diameter by 4 feet long (Figure 6). Provide one 6 foot long metal t-post to support each tree shelter (Figure 6). Provide approximately 24 inches (length) of bailing wire per tree shelter to be installed at the top of the tree shelter (Figure 6).

2.5 MULCH

Provide coarse textured wood chip mulch

3.0 IMPLEMENTATION

3.1 LIMITS-OF-WORK

Site preparation, plant installation and maintenance will be conducted within the Perimeter, Berm and Terrace Planting Areas shown in Figures 2 and 3.

3.2 PLANTING AREA PREPARATION

The owner's representative will flag all existing native trees and shrubs that occur within the planting areas. Provide protective fencing around the dripline of all existing native trees and shrubs identified by the owner's representative. Do not disturb existing native trees and shrubs at the site. Clear and dispose off-site all unnatural debris (e.g. trash) that occurs within the planting areas. In addition, the owner's representative will mark the locations of all non-native woody vegetation (trees and shrubs) present within the planting areas, if applicable.

Remove and dispose off-site all non-native woody vegetation present in the planting areas. Use herbicides approved by the EPA for use in aquatic settings to spot treat non-native woody plants prior to removal from the site. Manually remove roots and stems of non-native woody plant seedlings and dispose of off-site.

If the average height of herbaceous vegetation (grasses and forbs) is greater than 0.5 feet within a planting area, mow the vegetation to a height of 0.25 feet prior to revegetation installation.

3.3 REVEGETATION INSTALLATION

3.3.1 Planting Layout. Flag the planting location (using colored flags to denote each species) for each container plant to be installed in accordance with the typical planting plan layouts provided in Figures 4 and 5 and with the specifications provided in Tables 1, 2 and 3. The owner's representative shall review the flagged locations in the field prior to plant installation. The contractor shall adjust the flagged locations at the direction of the owner's representative prior to plant installation.

3.3.2 Plant Installation. Install container plants between October 15 and December 31. Do not install plants between January 1 and October 15 unless directed by the owner's representative. Install plants in accordance with the details provided in Figure 6. Remove plants from the containers in such a manner that the ball of earth surrounding the roots is not broken and plant immediately after removal from the container. Containers shall not be cut until just prior to plant installation. Roots of plants not in containers shall be kept moist and covered at all times, and shall not be exposed to the air except while actually being placed in the ground.

Set plants in flat bottomed holes to such depth that, after the soil has settled, the top of the root ball shall be as shown on the plans (Figure 6). Install plants in such a manner that the roots are not restricted or distorted. Any plants that have settled deeper than indicated on the plans after initial irrigation shall be raised back to the required level.

3.3.3 Watering. Apply water to the holes immediately prior to plant installation such that the soil within the hole is saturated throughout the full depth of the hole. Water all plants immediately after planting with a quantity of water sufficient to thoroughly saturate the root ball and the soil around and below the root ball.

Assure that the water pressure from the water truck hose is low enough to prevent scour of soil and mulch during water application. The Kaweah Delta Water Conservation District will provide a water truck and truck driver. The Contractor will water each plant using the water truck hose with a flow dissipater bulb at the hose end.

3.3.4 Soil Amendments. Soil amendments are not required.

3.3.5 Irrigation Basins. Construct irrigation basins around each installed tree and shrub in accordance with the dimensions specified in Figure 6. Assure that the irrigation basin berm is sufficiently compacted to hold water.

3.3.6 Plant Protection. Install photodegradable tree shelters for each valley oak planting per the details shown in Figure 6. Do not install tree shelters for plantings other than valley oak.

3.3.7 Wood Chip Mulch. Spread a 3-inch thick layer of coarse wood chip mulch to cover the bottom of each irrigation basin (Figure 6).

4.0 MAINTENANCE

4.1 MAINTENANCE PERIOD

Maintain all trees and shrubs installed for a period of three years commencing upon the completion of revegetation installation (Section 3.3). If replanting is required, the replanted trees and shrubs will be maintained for 2 years from the time of installation.

4.2 WEED CONTROL

4.2.1 Weed Control Within Irrigation Basins. Replenish the wood chip mulch layer as often as is necessary to maintain a minimum 3-inch thick mulch layer within each irrigation basin. Maintenance of the wood chip mulch layer will be the primary means of weed control in the immediate vicinity of each planting.

Conduct manual weeding or herbicide treatment as needed to keep a 4-foot diameter area around each planted tree and shrub weed free. If herbicides are used, ensure that the herbicide treatment does not contact the stem or foliage of the planted tree or shrub.

4.2.2 General Site Weed Control. Keep weeds throughout the planting areas to a maximum height of 1-foot year round by use of a mower or weed whacker. Do not use a weed whacker, mower or other mechanical device within 4 feet of the plants.

Prior to mowing, weeding, or herbicide application the owner's representative will use colored flagging or surveyors lath to mark the locations of native tree and shrub seedlings that colonize the gaps between the plantings. The Contractor will avoid damage to these naturally recruited native tree and shrub seedlings.

4.2.3 Invasive Non-native Plants. An invasive non-native plant species is one that has the potential to decrease the growth rate and vigor of native tree and shrub species via competition for resources. The owner's representative will monitor the site for invasive, non-native plants and will direct the Contractor to eradicate these plants when necessary. The Contractor will eradicate invasive, non-native plants as directed by the owner's representative on a time and materials basis.

4.3 IRRIGATION

4.3.1 Irrigation Schedule and Volume. During the first year following plant installation, irrigate each tree and shrub planting with enough regularity (approximately 3-5 times per month from March 1 through October 30), to keep the soils moist within the root zone. During the second and third years following plant installation, irrigate each tree and shrub planting with enough regularity to prevent the visible signs of drought stress. The irrigation schedule in Year-2 is anticipated to be substantially less than that for Year-1 (approximately 2-3 times per month from March 1 through October 30). In Year-3, little irrigation (0-2 times per month from March 1 through October 30)

should be required to prevent the visible signs of drought stress. Apply a minimum of 12 gallons/tree or shrub during each irrigation event.

4.3.2 Irrigation Method. The Kaweah Delta Water Conservation District will provide a water truck and truck driver. The Contractor shall water each plant using the water truck hose with a flow dissipater bulb attached. Assure that the water pressure from the water truck hose is low enough to prevent scour of soil and wood chip mulch layer during water application.

4.3.3 Irrigation Basins. During the months when irrigation is required, reconstruct the irrigation basins as needed around each tree and shrub planting to ensure that the basins retain the dimensions specified in Figure 6 and function to hold irrigation water.

4.4 PLANT PROTECTION

4.4.1 Tree Shelter Maintenance For Oak Plantings. Ensure that all tree shelters remain upright (vertical) and buried a minimum of 2 inches below the grade. Remove bailing wire when each tree reaches the top of its tree shelter. Do not remove the tree shelters at the end of the three-year maintenance period.

4.4.2 Other Non-Oak Tree and Shrub Plantings. The owner's representative will monitor the California sycamore, Oregon ash, Mexican elderberry, and shrub plantings during the three-year maintenance period to determine if animal damage is significantly affecting establishment of these plantings. If observations reveal that animal damage is a significant problem for trees and shrubs planted without protection, the owner's representative will specify measures to alleviate the problem. At such time, the contractor will perform the recommended plant protection work on a time and charges basis upon approval by the owner's representative.

4.5 PERFORMANCE CRITERIA

4.5.1 Percent Survival Criteria and Replanting

The owner's representative will determine the percent survival for trees and shrubs at the end of each year of maintenance. The percent survival will be defined as follows:

% tree survival = number live trees/total number trees originally installed x 100
% shrub survival = number live shrubs/total number shrubs originally installed x 100

The performance criteria for percent tree survival and percent shrub survival is 75%, respectively. If percent tree and/or shrub survival falls below 75 % at any time during the three-year maintenance period, the Contractor shall replace and replant all dead trees and shrubs. The owner's representative will specify the species and numbers to be replanted. Replanted trees and shrubs will be maintained for a period of two years from the date of replanting.

Replanting shall be accomplished in accordance with the specifications provided in Sections 2.2 and 3.3. Plants should be replanted in the October 15 – February 30 period following the survival counts. All costs associated with replanting will be born by the Contractor.

4.5.2 Weed Control

The area within the irrigation basin of all plantings shall be kept weed free (Section 4.2.1).

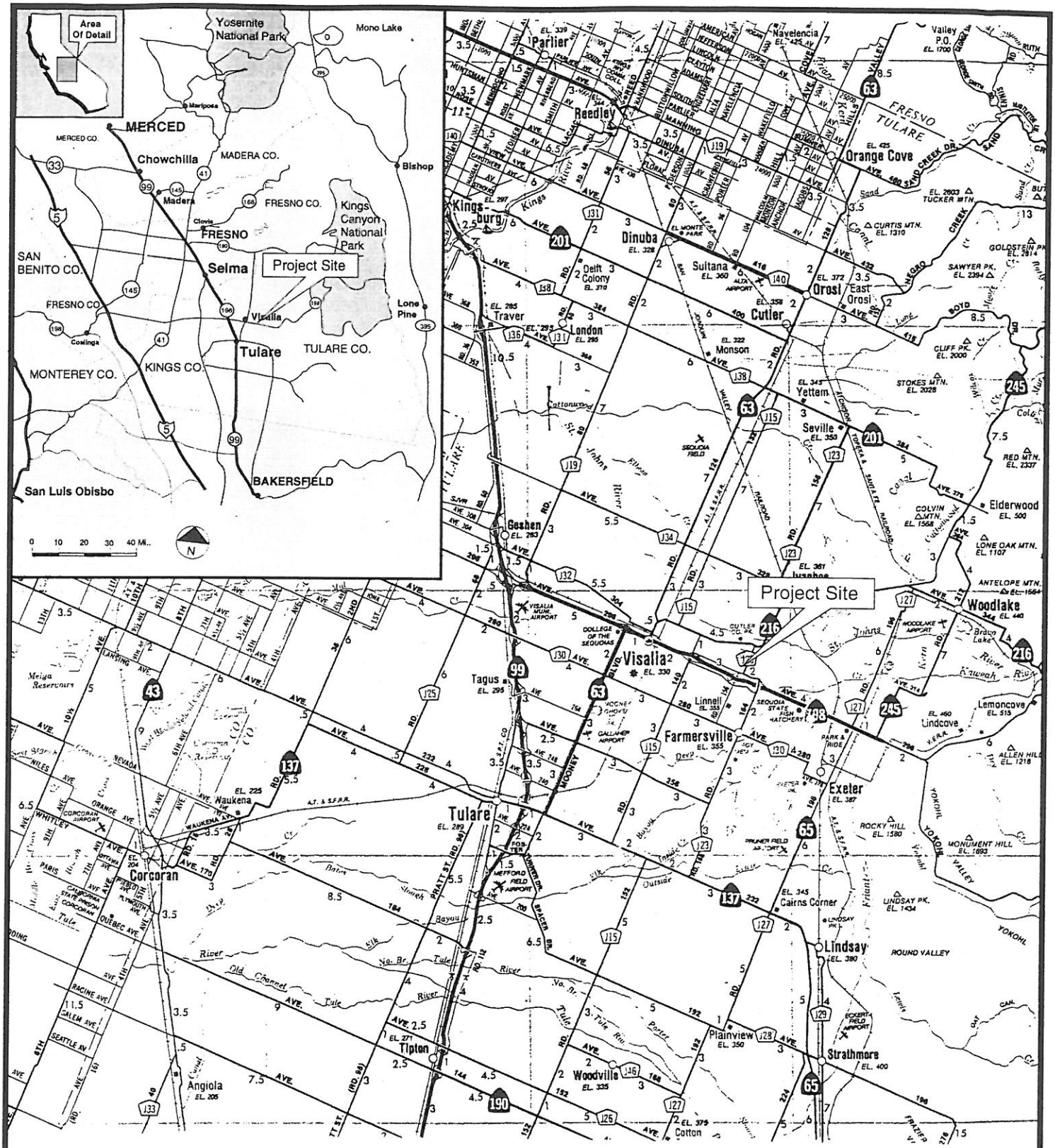
Herbaceous vegetation growing in the area between irrigation basins shall not be taller than 1 foot at all times during the maintenance period (Section 4.2.2)

4.6 REVIEWS

The owner's representative will conduct periodic reviews to evaluate if the revegetation and site maintenance work accomplished meets the specifications presented herein. The first review will occur immediately after completion of revegetation installation. The owner's representative will conduct subsequent reviews during the three-year maintenance period timed at his/her discretion. At the end of the three-year maintenance period, the owner's representative will conduct a final review. The Contractor shall schedule the final review with the owner's representative.

If the owner's representative during a particular review requires corrective action, this corrective action shall be in accordance with the specifications. The Contractor shall complete the corrective actions requested by the owner's representative and shall again request a review. The Contractor shall continue maintenance of the planting areas throughout the site until such time as corrective measures have been completed by the Contractor and accepted by the owner's representative.

The maintenance period ends on the date on which the owner's representative issues a letter of Final Acceptance to the Contractor.



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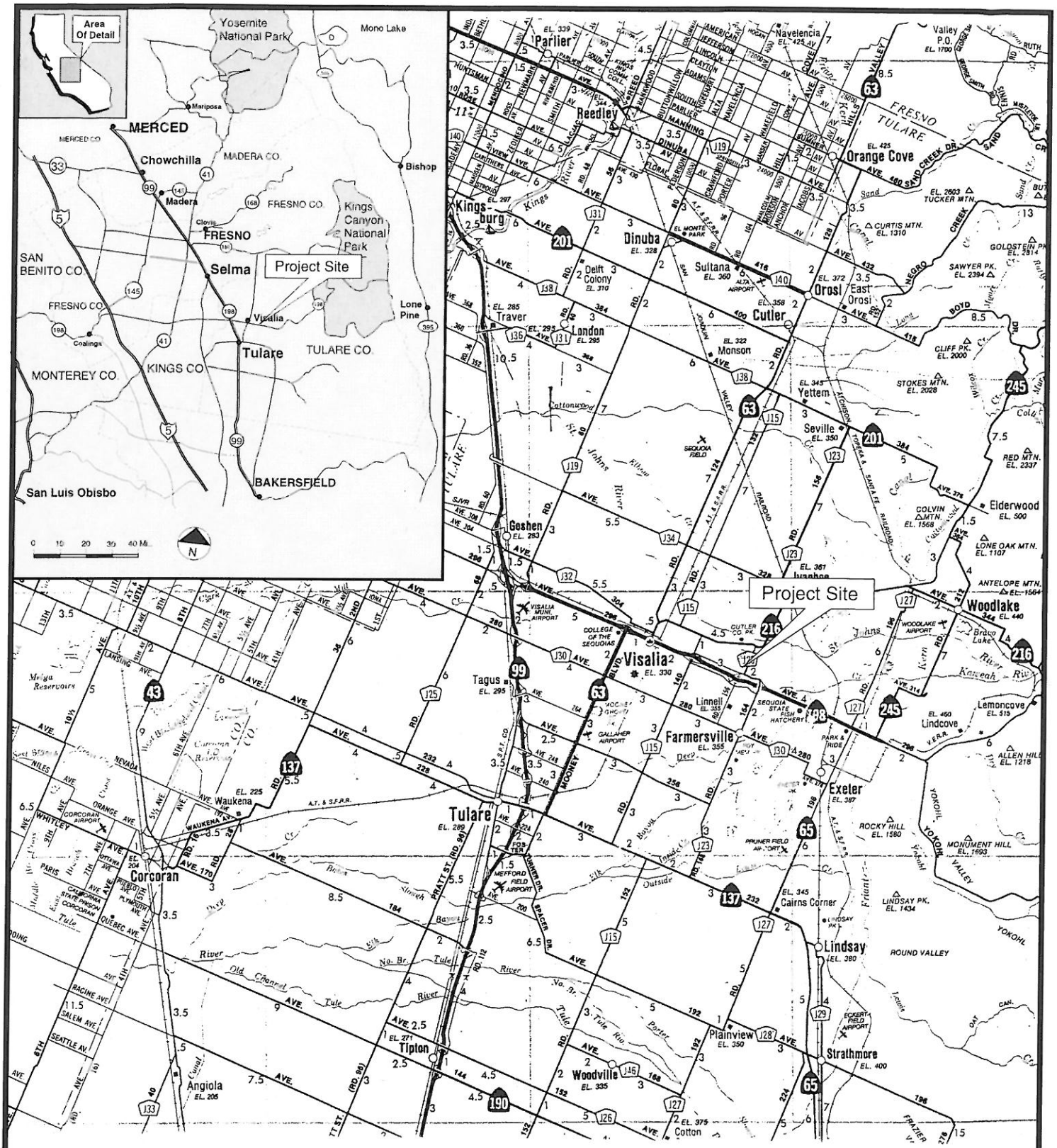
H.T. HARVEY & ASSOCIATES
ECOLOGICAL CONSULTANTS

Oakes Basin Revegetation Plans: Vicinity Map

File No. 1262-01	Date 8/6/99	Figure 1



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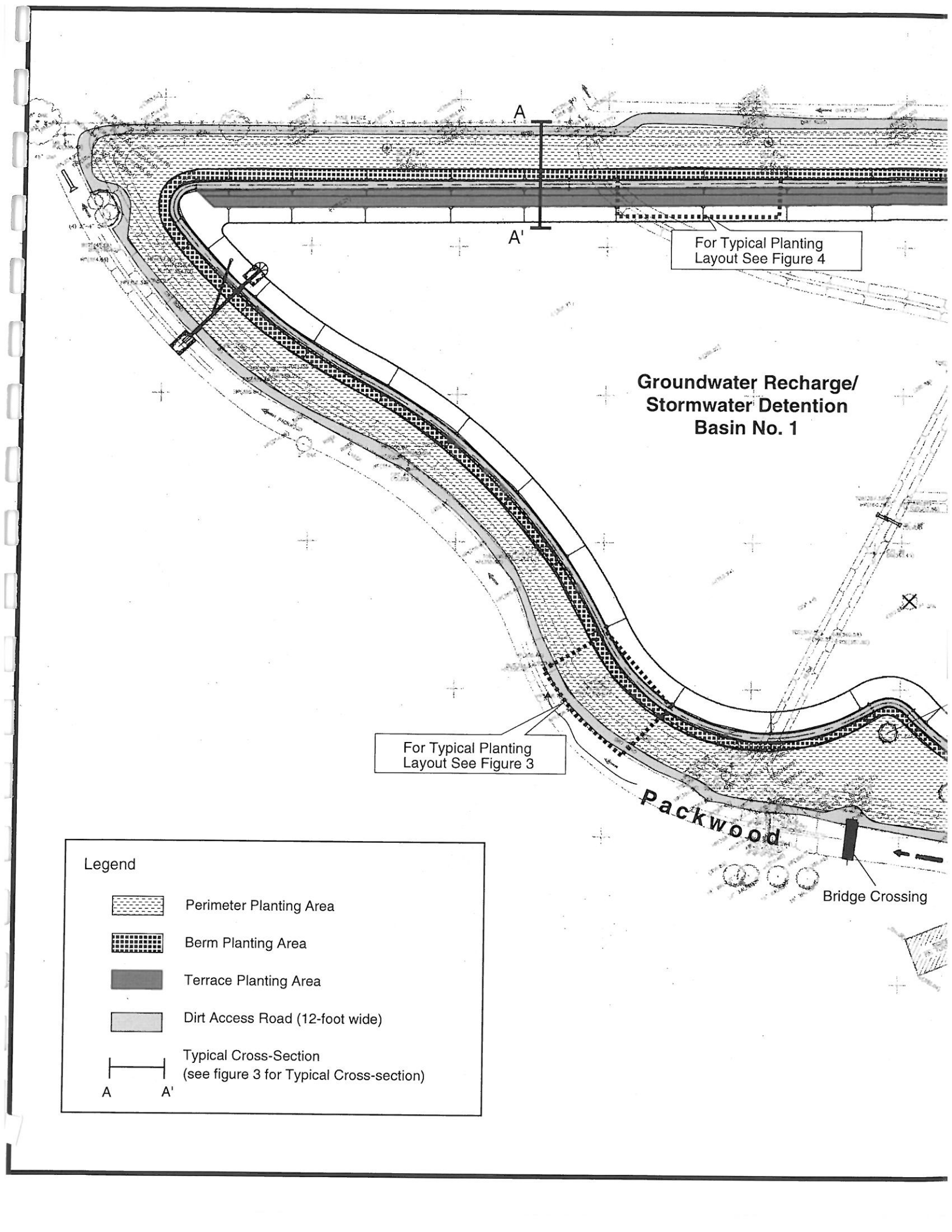
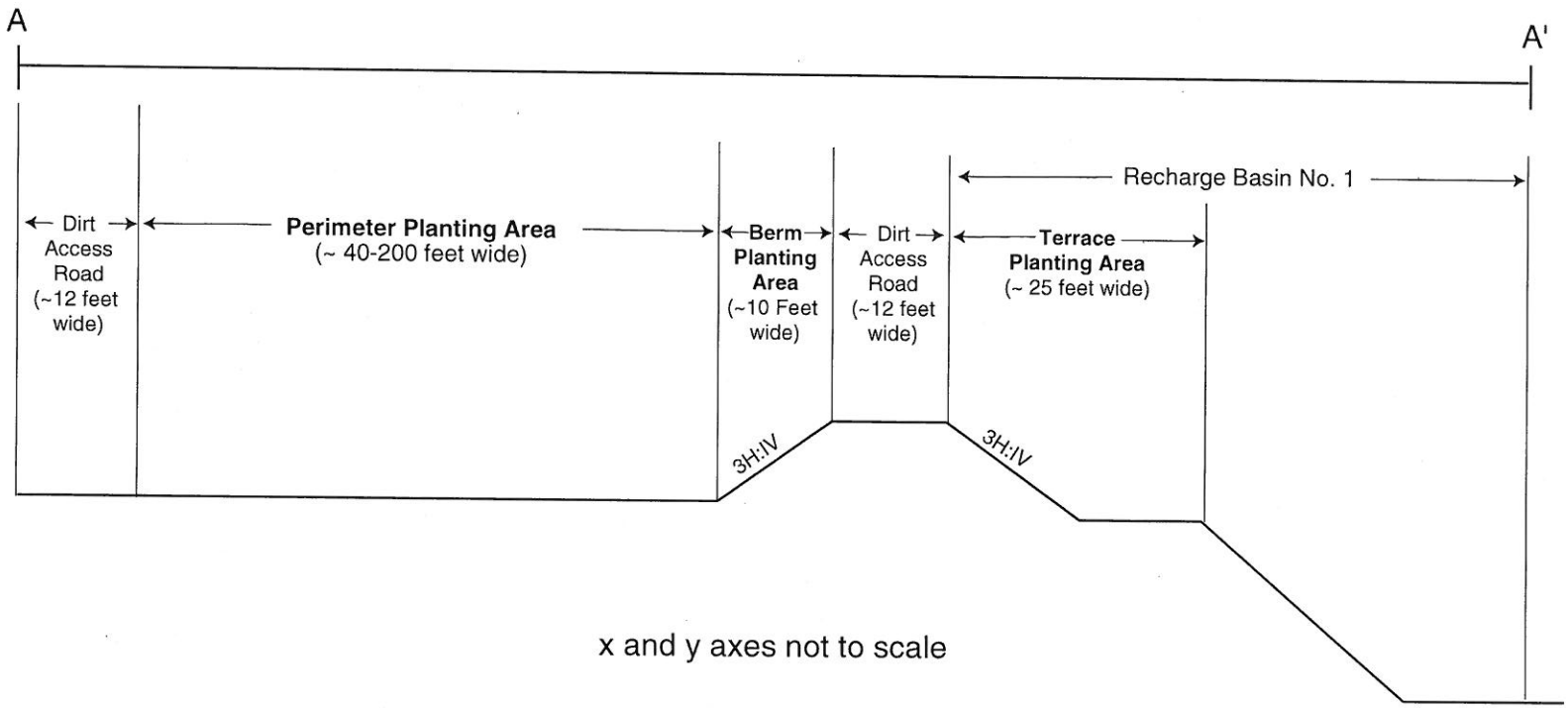
Oakes Basin Revegetation Plans: Vicinity Map

File No. 1262-01	Date 8/6/99	Figure 1


A
A'
For Typical Planting Layout See Figure 4
Groundwater Recharge/ Stormwater Detention Basin No. 1
For Typical Planting Layout See Figure 3
Packwood
Bridge Crossing
Legend
Perimeter Planting Area
Berm Planting Area
Terrace Planting Area
Dirt Access Road (12-foot wide)
Typical Cross-Section (see figure 3 for Typical Cross-section)
A
A'



x and y axes not to scale

H.T. HARVEY & ASSOCIATES
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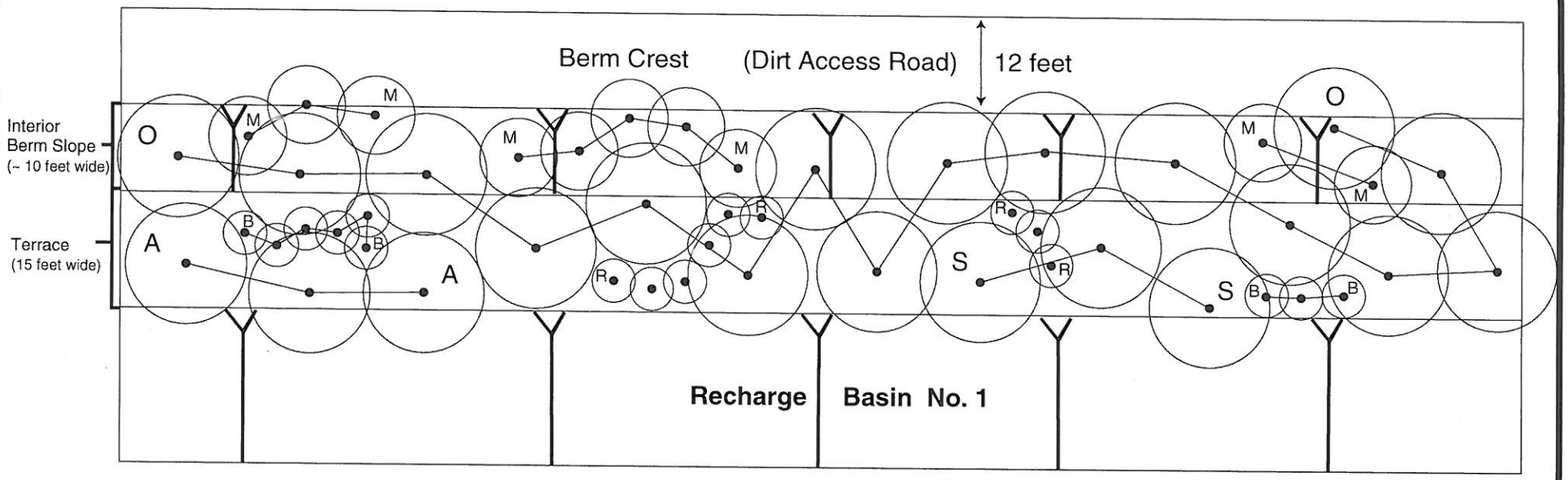
Oakes Basin Revegetation Plans: Typical Cross-Section Showing Location of Planting Areas

File No. 1262-01	Date 8/6/99	Figure 3



Growth Form	Symbol	Common Name	Scientific Name	Container Size	On-center Spacing (feet)
Tree	O	Valley oak	*Quercus lobata*	Treepot-4	16
	S	California sycamore	*Platanus racemosa*	Treepot-4	16
	A	Oregon ash	*Fraxinus latifolia*	Treepot-4	16
Shrub	B	California blackberry	*Rubus ursinus*	Deepot	6
	M	Mule fat	*Baccharis salicifolia*	Deepot	10
	R	California wild rose	*Rosa californica*	Deepot	6

N

0 20 feet

H.T. HARVEY & ASSOCIATES
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Oakes Basin Revegetation Plans: Typical Planting Layout for the Terrace Planting Area

File No. 1262-01 | Date 8/6/99 | Figure 5

LEGEND

1. Original grade in areas stripped of topsoil

2. Auger planting hole
   hole diameter = 1 foot
   hole depth = container length
   scarify sides and bottom of hole

3. Installed seedling tree or shrub

4. Backfill planting hole with rock free native topsoil.
   Assure that root crown is at or slightly above(0.5 inches) the soil surface following soil settlement after irrigation

5. Tree shelter (3-1/4 inches to 4-1/4 inches diameter by 4 feet long)
   Bury base 2 inches into topsoil, **Install for valley oak plantings only.**

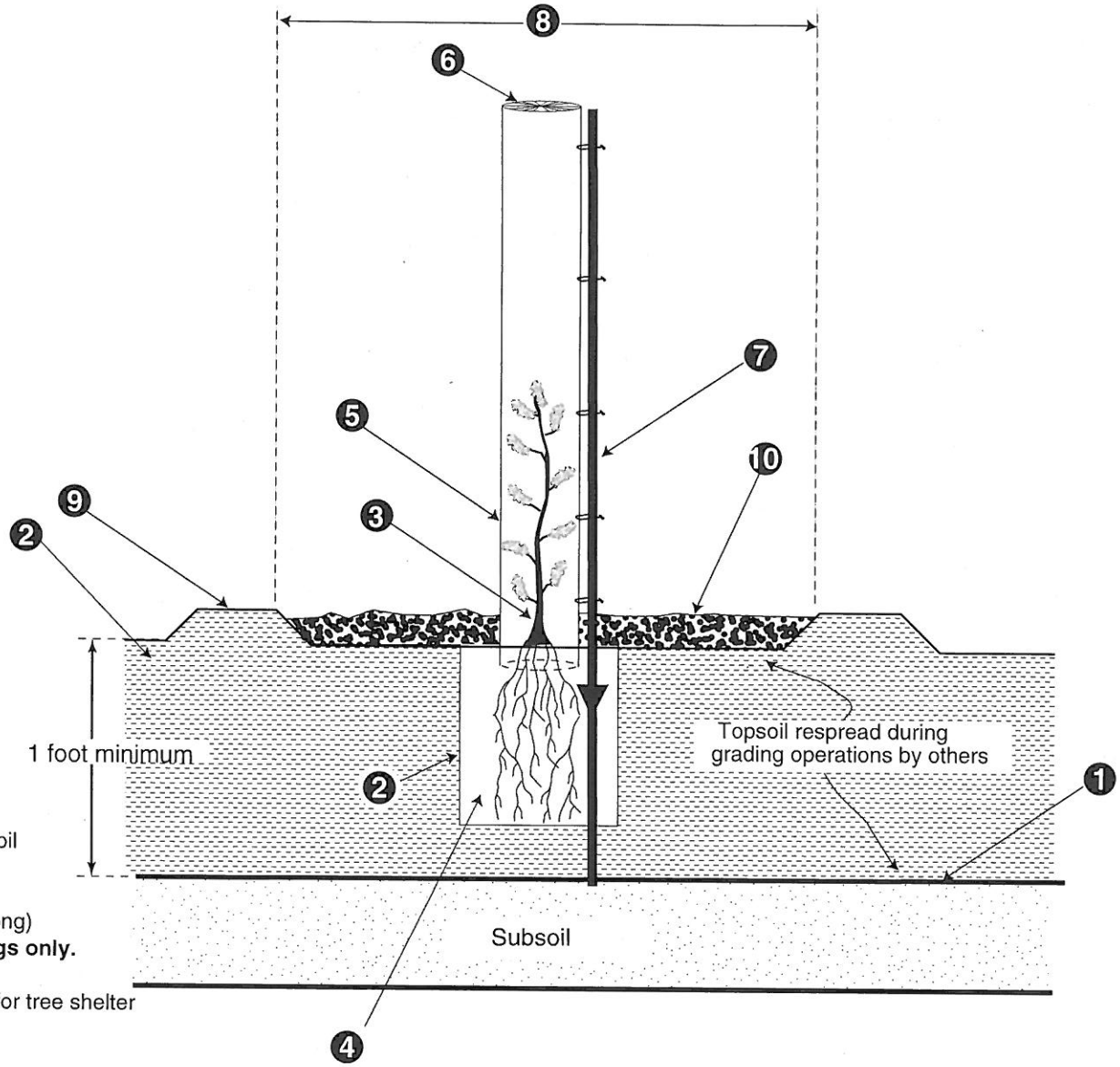
6. Protective wire cover, approximately 24 inches of bailing wire for tree shelter woven across the top of the tree shelter

7. Metal t-post (6 foot long), drive t-post 1.5-2.0 feet into ground and fasten tree shelter to post with ratchet-lock ties

8. Irrigation basin (minimum 3-foot diameter)

9. Irrigation basin berm minimum 4 inches wide at top and 4 inches above basin grade

10. Wood chip layer (minimum 3-inch thick layer)



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Oakes Basin Revegetation Plans:
Typical Plant Installation Detail

File No. 1262-01	Date 8/6/99	Figure 6

ATTACHMENT 3 – WORK PLAN

APPENDIX N

Kaweah Delta WCD Mitigated Negative Declaration for the Oakes Basin Demonstration Project, January 2005

MITIGATED NEGATIVE DECLARATION
OF
BOARD OF DIRECTORS
OF THE
KAWEAH DELTA WATER CONSERVATION DISTRICT

COUNTY CLERK
COUNTY OF TULARE

The project hereinafter described will, in our evaluation, have no significant effect on the environment and does not, therefore, require the filing of an Environmental Impact Report.

Board of Directors
Kaweah Delta Water Conservation
District

By: _____

Title: Secretary

Dated: December 17, 2002

Brief description of project:

Development of groundwater recharge and storm water control facilities on the site identified as Oakes Basin.

Reason(s) for negative declaration finding:

The facilities will assist in the reduction of groundwater overdraft conditions and aid in the control of defined storm water conditions. The project incorporates defined physical improvements and construction procedures determined to minimize any adverse environmental impacts.

Initial study prepared by:

Dennis R. Keller Consulting Engineer,
Kaweah Delta Water Conservation District

Initial study available at:

Kaweah Delta Water Conservation District Office,
2975 No. Farmersville Boulevard, Farmersville, California

ENVIRONMENTAL CHECKLIST FORM

1. **Project title:** Development of Oakes Basin

2. **Lead agency name and address:** Kaweah Delta Water Conservation District
P.O. Box 1247, Visalia, CA 93279

3. **Contract person and phone number:** Mr. Bruce George, 209/747-5601

4. **Project location:** See Attached Map

5. **Project sponsor's name and address:** Same

6. **General plan designation:** Agriculture-Exclusive

7. **Description of project:** (Describe the whole action involved, including but not limited to later phases of the project, and any secondary, support, or off-site features necessary for its implementation. Attach additional sheets if necessary.)

   Project Description: The project will consist of the creation of the parcel of land pursuant to the provisions of the Subdivision Map Act. The project will also involve the development of the parcel into a groundwater recharge and stormwater control basin with revegitation efforts. Flow control, flow measurement and access structures will be constructed.

8. **Surrounding land uses and setting:** (Briefly describe the project's surroundings)

   Agriculture and water conveyance facilities

9. **Other public agencies whose approval is required** (e.g., permits, financing approval, or participation agreement.)

   None

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project;

☐ Land Use and Planning	☐ Transportation/Circulation	☒ Public Services
☐ Population and Housing	☒ Biological Resources	☒ Utilities and Service Systems
☐ Geological Problems	☐ Energy and Mineral Reserves	☐ Aesthetics
☒ Water	☐ Hazards	☐ Cultural Resources
☐ Air Quality	☐ Noise	☐ Recreation
	☐ Mandatory Findings of Significance	

DETERMINATION: (To be completed by the Lead Agency)

On the basis of this initial evaluation:

☒ I find that the proposed COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because the mitigation measures described on an attached sheet have been added to the project. A NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a significant effect(s) on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets, if the effect is a "potentially significant impact" or "potentially significant unless mitigated." An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, there WILL NOT be a significant effect in this case because all potentially significant effects (a) have been analyzed adequately in an earlier EIR pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR, including revisions or mitigation measures that are imposed upon the proposed project.

Signature: Dennis R. Keller Date: March 4, 1997

Printed Name: Dennis R. Keller, RCE For: Kaweah Delta Water Conservation District

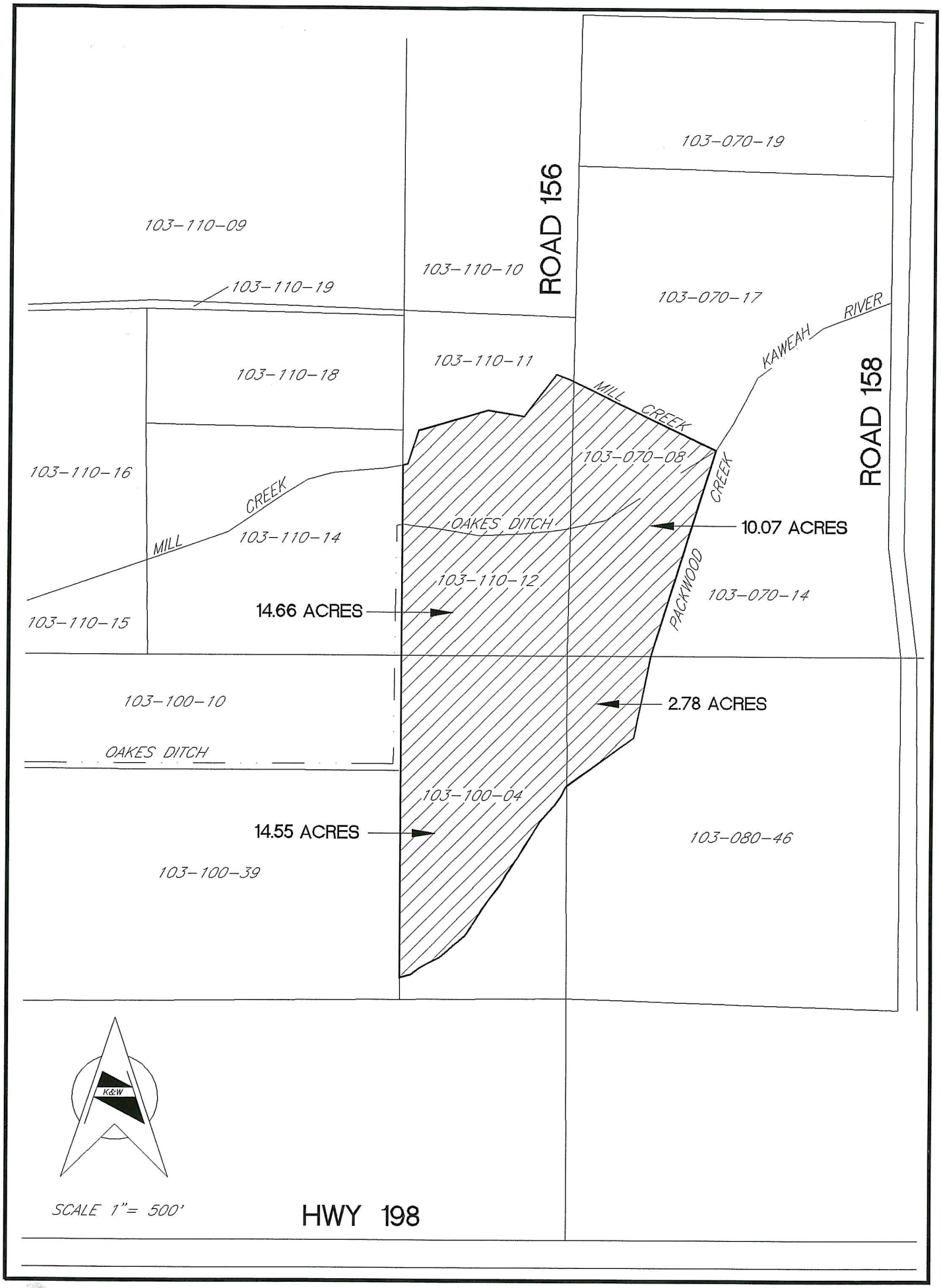
ENVIRONMENTAL IMPACTS:

I. **LAND USE AND PLANNING**. *Would the proposal*:	*Potentially Significant Impact*	*Potentially Significant Unless Mitigation Incorporated*	*Less than Significant Impact*	*No Impact*
a) Conflict with general plan designation or zoning?	___	___	___	X
b) Conflict with applicable environmental plans or policies adopted by agencies with jurisdiction over the project?	___	___	___	X
c) Be incompatible with existing land use in the vicinity?	___	___	___	X
d) Affect agricultural resources or operations (e.g., impacts to soils or farmlands, or impacts from incompatible land uses?)	___	___	___	X
e) Disrupt or divide the physical arrangement of an established community (including a low-income or minority community)?	___	___	___	X
II. POPULATION AND HOUSING. *Would the proposal*:				
a) Cumulatively exceed official regional or local population projections?	___	___	___	X

II. POPULATION AND HOUSING - *Continued*	*Potentially Significant Impact*	*Potentially Significant Unless Mitigation Incorporated*	*Less than Significant Impact*	*No Impact*
b) Induce substantial growth in an area either directly or indirectly (e.g., through projects in an undeveloped area or extension of major infrastructure)?	___	___	___	X
c) Displace existing housing, especially affordable housing?	___	___	___	X
III. GEOLOGIC PROBLEMS. *Would the proposal result in or expose people to potential impacts involving*:				
a) Fault rupture?	___	___	___	X
b) Seismic ground shaking?	___	___	___	X
c) Seismic ground failure, including liquefaction?	___	___	___	X
d) Seiche, tsunami, or volcanic hazard?	___	___	___	X
e) Landslides or mudflows?	___	___	___	X
f) Erosion, changes in topography or unstable soil conditions from excavation, grading, or fill?	___	___	___	X
g) Subsidence of land?	___	___	___	X
h) Expansive soils?	___	___	___	X
i) Unique geologic or physical features?	___	___	___	X
IV. WATER. *Would the proposal result in*:				
a) Changes in absorption rates, drainage patterns, or the rate and amount of surface runoff?	___	___	___	X
b) Exposure of people or property to water related hazards such as flooding?	___	___	___	X
c) Discharge into surface waters or other alteration of surface water quality (e.g., temperature, dissolved oxygen or turbidity?	___	___	X	___
d) Changes in the amount of surface water in any water body?	___	___	X	___
e) Changes in currents, or the course or direction of water movements?	___	___	___	X
f) Changes in the quantity of ground waters, either through direct additions or withdrawals, or through interception of an aquifer by cuts or excavations or through substantial loss of groundwater recharge capability?	___	___	X	___
g) Altered direction or rate of flow of groundwater?	___	___	X	___
h) Impacts to groundwater quality?	___	___	___	X
i) Substantial reduction in the amount of groundwater otherwise available for public water supplies?	___	___	___	X
V. AIR QUALITY. *Would the proposal*:				
a) Violate any air quality standard or contribute to an existing or projected air quality violation?	___	___	___	X
b) Expose sensitive receptors to pollutants?	___	___	___	X
c) Alter air movement, moisture, or temperature, or cause any change in climate?	___	___	___	X
d) Create objectionable odors?	___	___	___	X
VI. TRANSPORTATION/CIRCULATION. *Would the proposal result in*:				
a) Increased vehicle trips or traffic congestion?	___	___	___	X
b) Hazards to safety from design features (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	___	___	___	X
c) Inadequate emergency access or access to nearby uses?	___	___	___	X

	Potentially Significant Impact	*Potentially Significant Unless Mitigation Incorporated*	*Less than Significant Impact*	*No Impact*
VI. TRANSPORTATION/CIRCULATION - *Continued*				
d) Insufficient parking capacity onsite or offsite?	___	___	___	X
e) Hazards or barriers for pedestrians or bicyclists?	___	___	___	X
f) Conflicts with adopted policies supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	___	___	___	X
g) Rail, waterborne or air traffic impacts?	___	___	___	X
VII. BIOLOGICAL RESOUCES. *Would the proposal result in impacts to*:				
a) Endangered, threatened or rare species or their habitats (including but not limited to plants, fish, insects, animals, and birds?	___	___	___	X
b) Locally designated species (e.g., heritage trees)?	___	___	___	X
c) Locally designated natural communities (e.g., oak forest, coastal habitat, etc)?	___	___	___	X
d) Wetland habitat (e.g., marsh, riparian, and vernal pool)?	___	___	___	X
e) Wildlife dispersal or migration corridors?	___	___	___	X
VIII. ENERGY AND MINERAL RESOURCES. *Would the proposal*:				
a) Conflict with adopted energy conservation plans?	___	___	___	X
b) Use nonrenewable resources in a wasteful and inefficient manner?	___	___	___	X
c) Result in the loss of availability of a known mineral resource that would be of future value to the region and the residents of the State?	___	___	___	X
IX. HAZARDS. *Would the proposal involve*:				
a) A risk of accidental explosion or release of hazardous substances (including, but not limited to, oil, pesticides, chemicals, or radiation)?	___	___	___	X
b) Possible interference with an emergency response plan or emergency evacuation plan?	___	___	___	X
c) The creation of any health hazard or potential health hazard?	___	___	___	X
d) Exposure of people to existing sources of potential health hazards?	___	___	___	X
e) Increase fire hazard in areas with flammable brush, grass, or trees?	___	___	___	X
X. NOISE. *Would the proposal result in*:				
a) Increases in existing noise levels?	___	___	___	X
b) Exposure of people to severe noise levels?	___	___	___	X
XI. PUBLIC SERVICES. *Would the proposal have an effect upon, or result in a need for new or altered government services in any of the following areas*:				
a) Fire protection?	___	___	___	X
b) Police protection?	___	___	___	X
c) Schools?	___	___	___	X
d) Maintenance of public facilities, including roads?	___	___	___	X
e) Other government services?	___	___	X	___

	Potentially Significant Impact	*Potentially Significant Unless Mitigation Incorporated*	*Less than Significant Impact*	*No Impact*
XII. UTILITIES AND SERVICE SYSTEMS. *Would the proposal result in a need for new systems or supplies, or substantial alterations to the following utilities*:				
a) Power or natural gas?	___	___	___	X
b) Communications systems?	___	___	___	X
c) Local or regional water treatment or distribution facilities?	___	___	___	X
d) Sewer or septic tanks?	___	___	___	X
e) Storm water drainage?	___	___	___	X
f) Solid waste disposal?	___	___	___	X
g) Local or regional water supplies?	___	___	___	X
	___	___	___	X
XIII. AESTHETICS. *Would the proposal*:				
a) Affect a scenic vista or scenic highway?	___	___	___	X
b) Have a demonstrable negative aesthetic effect?	___	___	___	X
c) Create light or glare?	___	___	___	X
XIV. CULTURAL RESOURCES. *Would the proposal*:				
a) Disturb paleontological resources?	___	___	___	X
b) Disturb archaeological resources?	___	___	___	X
c) Have the potential to cause a physical change which would affect unique ethnic cultural values?	___	___	___	X
d) Restrict existing religious or sacred uses within the potential impact area?	___	___	___	X
XV. RECREATION. *Would the proposal*:				
a) Increase the demand for neighborhood or regional parks or other recreational facilities?	___	___	___	X
b) Affect existing recreational opportunities?	___	___	___	X
XVI. MANDATORY FINDINGS OF SIGNIFICANCE.				
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	___	___	___	X
b) Does the project have the potential to achieve short-term, to the disadvantage of long-term, environmental goals?	___	___	___	X
c) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)	___	___	___	X
d) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	___	___	___	X

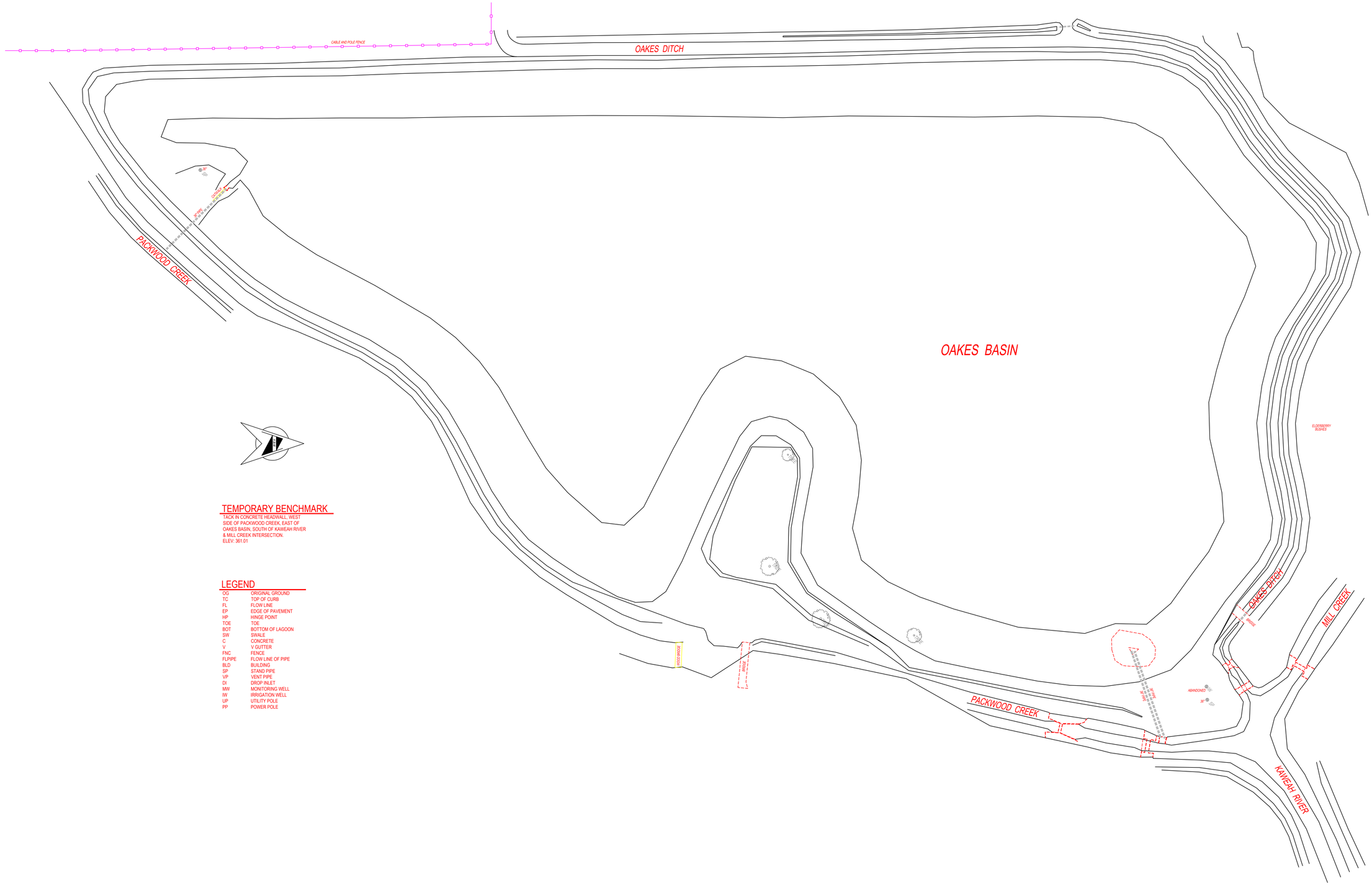

103-070-19
ROAD 156
103-110-09
103-110-10
103-110-19
103-070-17
KAWEAH RIVER
ROAD 158
103-110-18
103-110-11
MILL CREEK
103-070-08
103-110-16
CREEK
OAKES DITCH
10.07 ACRES
MILL
CREEK
103-110-14
PACKWOOD
103-110-12
103-070-14
14.66 ACRES
103-110-15
103-100-10
2.78 ACRES
OAKES DITCH
103-100-04
14.55 ACRES
103-080-46
103-100-39
K&W
SCALE 1"= 500'
HWY 198

ATTACHMENT 3 – WORK PLAN

APPENDIX O

Kaweah Delta WCD Oakes Basin Demonstration Project Final Construction Plans and Contract Documents, April 2005

FILE NO. ####



TEMPORARY BENCHMARK

TACK IN CONCRETE HEADWALL, WEST SIDE OF PACKWOOD CREEK, EAST OF OAKES BASIN, SOUTH OF KAWEAH RIVER & MILL CREEK INTERSECTION.
ELEV: 361.01

LEGEND

OG	ORIGINAL GROUND
TC	TOP OF CURB
FL	FLOW LINE
EP	EDGE OF PAVEMENT
HP	HINGE POINT
TOE	TOE
BOT	BOTTOM OF LAGOON
SW	SWALE
C	CONCRETE
V	V GUTTER
FNC	FENCE
FLPIPE	FLOW LINE OF PIPE
BLD	BUILDING
SP	STAND PIPE
VP	VENT PIPE
DI	DROP INLET
MW	MONITORING WELL
IW	IRRIGATION WELL
UP	UTILITY POLE
PP	POWER POLE

REVISION	DATE	DESCRIPTION	APPROVED

KAWEAH DELTA WATER CONSERVATION DISTRICT

OAKES BASIN

PLAN SCALE: 1"=70'

DRAWN BY: T. SIMPSON

APPROVED BY: D.R. KELLER

C.E. NO. 24199 DATE: 12/30/10

DENNIS R. KELLER
JAMES H. WEGLEY
CONSULTING ENGINEERS
209 SOUTH LOCUST STREET
VISALIA, CALIFORNIA 93291 559-732-7938

SHEET 1 OF 1

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